Antiplasmodial and Radical Scavenging Activities of Flavonoids from Kenyan *Erythrina* species

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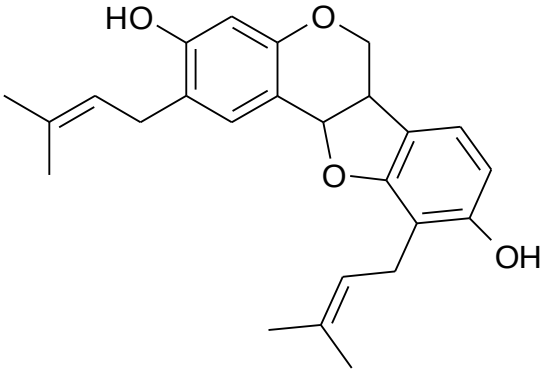
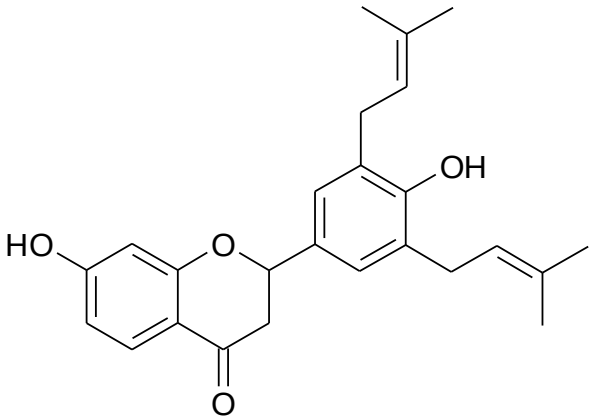
The success of quinine and artemisinin as potent natural antimalarial drugs demonstrates the importance of plants, especially those used in traditional medicine, as potential source of antimalarial agents. *Erythrina abyssinica* (Leguminosae) is one of the most widely used plants to treat malaria in East Africa. The root bark of this plant showed antiplasmodial activity against the chloroquine sensitive (D6) and chloroquine resistant (W2) strains of *Plasmodium falciparum*, with IC_{50} values of 0.64 and 0.49 μg/ml, respectively (Yenesew et al., 2003). Several compounds isolated from this plant (Kamat et al., 1981; Yenesew et al., 2003) were also tested (Yenesew et al., 2003; 2004). Activity was observed among pterocarpans (e.g. erythrabyssin-II, IC_{50} 8.1 and 6.5 μM against the D6 and W2 strains, respectively), and flavanones (e.g. abyssinone-IV, IC_{50} 9.0 and 7.7 μM against D6 and W2 strains, respectively). However the activities of these compounds individually are much lower than that of the crude extract, indicating that these flavonoids and isoflavonoids may be more effective as mixtures.



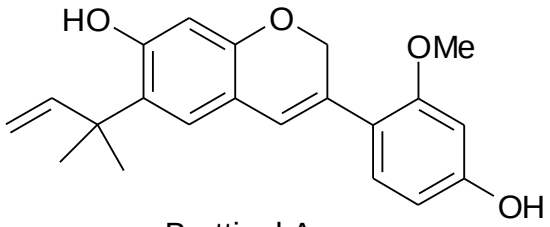
Erythrabyssin II



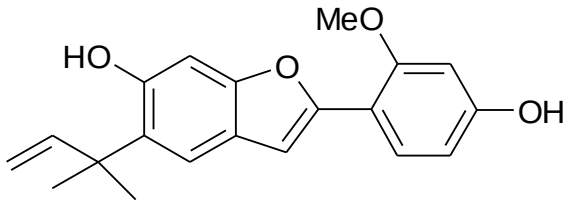
Abyssinone-IV

Four additional *Erythrina* species of Kenya, namely *E. burttii, E. melanacantha* and *E. sacleuxii*, have been tested for antiplasmodial activities. Among these the root bark of *E. burttii* showed good antiplasmodial activity with IC_{50} value of 0.97 and 2.0 μg/ml against the D6 and W2 strains of *Plasmodium falciparum*, respectively. Flavonoids and isoflavonoids including isoflav-3-enes (eg burttinol A) and an aryl benzofuran burttinol D have been identified as the active principles. The root bark of *E. sacleuxii* was also active, with the most active compound being the isoflavone erusubin F (IC_{50} 9.0±2.1 and 7.7±1.6 μM against D6 and W2 strains respectively (Yenesew et al., 2006). In an *in vivo* assay, the extracts of the roots *E. abyssinica, E. burttii* and *E. sacleuxii* showed significant antimalarial activities against *Plasmodium berghei.*

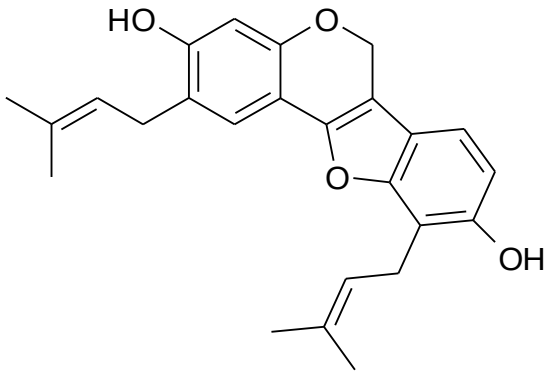
Oxidative stress normally follows malaria infection. This is due to elevated production of reactive oxygen species (Bahorun et al., 1996). It is therefore important that cells are protected from oxidative burden through the use of effective antioxidants. In a Radical Scavenging Activity (RSA) assay against 1,1-diphenyl-2-picrylhydrazyl (DPPH) free radical, using spectrophotometric method, the crude acetone extract of the root bark of *E. abyssinica* at 10 μg/ml showed RSA of 82.2 %. In activity guided fractionation of the crude acetone extract, the pterocarpene erycristagallin, was identified as the most active principle with EC_{50} value of 8.2 μM (Yenesew et al., 2009). The root bark of *Erythrina burttii* also showed high RSA activity (EC_{50} values of 10.8 μg/ml) and the isoflav-3-enes burttinol A and the aryl benzofuran burttinol D have been identified as the most active principles.



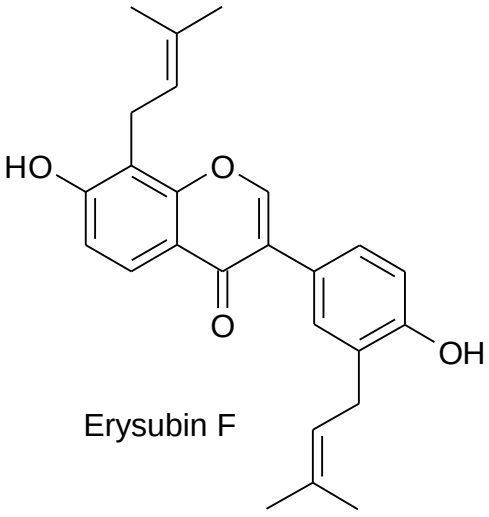
Burttinol A



Burttinol D



Erycristagallin



Erysubin F

In conclusion, the wide traditional use of *Erythrina abyssinica* for treatment of malaria in East Africa has been justified. Antiplasmodial and radical scavenging activities have also been observed in other *Erythrina* species, *E. burttii* showing the highest activity. The

activities of these plants are associated with flavonoids and isoflavonoids which appear to be more effective as mixtures rather than as pure compounds.

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